Postel

Network Working Group
Request for Comments: 1160
Obsoletes: RFC 1120

V. Cerf
NRI
May 1990

The Internet Activities Board

Status of this Memo

This RFC provides a history and description of the Internet Activities Board (IAB) and its subsidiary organizations. This memo is for informational use and does not constitute a standard. This is a revision of RFC 1120. Distribution of this memo is unlimited.

1. Introduction

In 1968, the U.S. Defense Advanced Research Projects Agency (DARPA) initiated an effort to develop a technology which is now known as packet switching. This technology had its roots in message switching methods, but was strongly influenced by the development of low-cost minicomputers and digital telecommunications techniques during the mid-1960's [BARAN 64, ROBERTS 70, HEART 70, ROBERTS 78]. A very useful survey of this technology can be found in [IEEE 78].

During the early 1970's, DARPA initiated a number of programs to explore the use of packet switching methods in alternative media including mobile radio, satellite and cable [IEEE 78]. Concurrently, Xerox Palo Alto Research Center (PARC) began an exploration of packet switching on coaxial cable which ultimately led to the development of Ethernet local area networks [METCALFE 76].

The successful implementation of packet radio and packet satellite technology raised the question of interconnecting ARPANET with other types of packet nets. A possible solution to this problem was proposed by Cerf and Kahn [CERF 74] in the form of an internetwork protocol and a set of gateways to connect the different networks. This solution was further developed as part of a research program in internetting sponsored by DARPA and resulted in a collection of computer communications protocols based on the original Transmission Control Protocol (TCP) and its lower level counterpart, Internet Protocol (IP). Together, these protocols, along with many others developed during the course of the research, are referred to as the TCP/IP Protocol Suite [RFC 1140, LEINER 85, POSTEL 85, CERF 82, CLARK 86].

In the early stages of the Internet research program, only a few researchers worked to develop and test versions of the internet protocols. Over time, the size of this activity increased until, in

1979, it was necessary to form an informal committee to guide the technical evolution of the protocol suite. This group was called the Internet Configuration Control Board (ICCB) and was established by Dr. Vinton Cerf who was then the DARPA program manager for the effort. Dr. David C. Clark of the Laboratory for Computer Science at Massachusetts Institute of Technology was named the chairman of this committee.

In January, 1983, the Defense Communications Agency, then responsible for the operation of the ARPANET, declared the TCP/IP protocol suite to be standard for the ARPANET and all systems on the network converted from the earlier Network Control Program (NCP) to TCP/IP. Late that year, the ICCB was reorganized by Dr. Barry Leiner, Cerf's successor at DARPA, around a series of task forces considering different technical aspects of internetting. The re-organized group was named the Internet Activities Board.

As the Internet expanded, it drew support from U.S. Government organizations including DARPA, the National Science Foundation (NSF), the Department of Energy (DOE) and the National Aeronautics and Space Administration (NASA). Key managers in these organizations, responsible for computer networking research and development, formed an informal Federal Research Internet Coordinating Committee (FRICC) to coordinate U.S. Government support for and development and use of the Internet system. The FRICC sponsored most of the U.S. research on internetting, including support for the Internet Activities Board and its subsidiary organizations.

In 1990, the FRICC was reorganized as part of a larger initiative sponsored by the networking subcommittee of the Federal Coordinating Committee on Science, Engineering and Technology (FCCSET). The reorganization created the Federal Networking Council (FNC) and its Working Groups. The membership of the FNC included all the former FRICC members and many other U.S. Government representatives. The first chairman of the FNC is Dr. Charles Brownstein of the National Science Foundation. The FNC is the Federal Government's body for coordinating the agencies that support the Internet. It provides liaison to the Office of Science and Technology Policy (headed by the President's Science Advisor) which is responsible for setting science and technology policy affecting the Internet. It endorses and employs the existing planning and operational activities of the community-based bodies that have grown up to manage the Internet in the United States. The FNC plans to involve user and supplier communities through creation of an external advisory board and will coordinate Internet activities with other Federal initiatives ranging from the Human Genome and Global Change programs to educational applications. The FNC has also participated in planning for the creation of a National Research and Education Network in the United

States.

At the international level, a Coordinating Committee for Intercontinental Research Networks (CCIRN) has been formed which includes the U.S. FNC and its counterparts in North America and Europe. Co-chaired by the executive directors of the FNC and the European Association of Research Networks (RARE), the CCIRN provides a forum for cooperative planning among the principal North American and European research networking bodies.

2. Internet Activities Board

The Internet Activities Board (IAB) is the coordinating committee for Internet design, engineering and management. The Internet is a collection of over two thousand of packet switched networks located principally in the U.S., but also in many other parts of the world, all interlinked and operating using the protocols of the TCP/IP protocol suite. The IAB is an independent committee of researchers and professionals with a technical interest in the health and evolution of the Internet system. Membership changes with time to adjust to the current realities of the research interests of the participants, the needs of the Internet system and the concerns of constituent members of the Internet.

IAB members are deeply committed to making the Internet function effectively and evolve to meet a large scale, high speed future. New members are appointed by the chairman of the IAB, with the advice and consent of the remaining members. The chairman serves a term of two years and is elected by the members of the IAB. The IAB focuses on the TCP/IP protocol suite, and extensions to the Internet system to support multiple protocol suites.

The IAB has two principal subsidiary task forces:

1) Internet Engineering Task Force (IETF)

2) Internet Research Task Force (IRTF)

Each of these Task Forces is led by a chairman and guided by a Steering Group which reports to the IAB through its chairman. Each task force is organized, by the chairman, as required, to carry out its charter. For the most part, a collection of Working Groups carries out the work program of each Task Force.

All decisions of the IAB are made public. The principal vehicle by which IAB decisions are propagated to the parties interested in the Internet and its TCP/IP protocol suite is the Request for Comment (RFC) note series. The archival RFC series was initiated in 1969 by

Dr. Stephen D. Crocker as a means of documenting the development of the original ARPANET protocol suite [RFC 1000]. The editor-in-chief of this series, Dr. Jonathan B. Postel, has maintained the quality of and managed the archiving of this series since its inception. A small proportion of the RFCs document Internet standards. Most of them are intended to stimulate comment and discussion. The small number which document standards are especially marked in a "status" section to indicate the special status of the document. An RFC summarizing the status of all standard RFCs is published regularly [RFC 1140].

RFCs describing experimental protocols, along with other submissions whose intent is merely to inform, are typically submitted directly to the RFC editor. A Standard Protocol starts out as a Proposed Standard and may be promoted to Draft Standard and finally Standard after suitable review, comment, implementation and testing.

Prior to publication of a Proposed Standard RFC, it is made available for comment through an on-line Internet-Draft directory. Typically, these Internet-Drafts are working documents of the IAB or of the working groups of the Internet Engineering and Research Task Forces. Internet-Drafts are either submitted to the RFC editor for publication or discarded within 3-6 months. Prior to promotion to Draft Standard or Standard, an Internet-Draft publication and review cycle may be initiated if significant changes to the RFC are contemplated.

The IAB performs the following functions:

1) Sets Internet Standards,

2) Manages the RFC publication process,

3) Reviews the operation of the IETF and IRTF,

4) Performs strategic planning for the Internet, identifying long-range problems and opportunities,

5) Acts as an international technical policy liaison and representative for the Internet community, and

6) Resolves technical issues which cannot be treated within the IETF or IRTF frameworks.

To supplement its work via electronic mail, the IAB meets quarterly to review the condition of the Internet, to review and approve proposed changes or additions to the TCP/IP suite of protocols, to set technical development priorities, to discuss policy matters which

may need the attention of the Internet sponsors, and to agree on the addition or retirement of IAB members and on the addition or retirement of task forces reporting to the IAB. Typically, two of the quarterly meetings are by means of video teleconferencing (provided, when possible, through the experimental Internet packet video-conferencing system). The minutes of the IAB meetings are published in the Internet Monthly on-line report.

The IAB membership is currently as follows:

Vinton Cerf/CNRI	Chairman
Robert Braden/USC-ISI	Executive Director
David Clark/MIT-LCS	IRTF Chairman
Phillip Gross/CNRI	IETF Chairman
Jonathan Postel/USC-ISI	RFC Editor
Hans-Werner Braun/Merit	Member
Lyman Chapin/DG	Member
Stephen Kent/BBN	Member
Anthony Lauck/Digital	Member
Barry Leiner/RIACS	Member
Daniel Lynch/Interop, Inc.	Member

3. The Internet Engineering Task Force

The Internet has grown to encompass a large number of widely geographically dispersed networks in academic and research communities. It now provides an infrastructure for a broad community with various interests. Moreover, the family of Internet protocols and system components has moved from experimental to commercial development. To help coordinate the operation, management and evolution of the Internet, the IAB established the Internet Engineering Task Force (IETF). The IETF is chaired by Mr. Phillip Gross and managed by its Internet Engineering Steering Group (IESG). The IAB has delegated to the IESG the general responsibility for making the Internet work and for the resolution of all short- and mid-range protocol and architectural issues required to make the Internet function effectively.

The charter of the IETF includes:

1) Responsibility for specifying the short and mid-term Internet protocols and architecture and recommending standards for IAB approval.

2) Provision of a forum for the exchange of information within the Internet community.

3) Identification of pressing and relevant short- to mid-range

operational and technical problem areas and convening of Working Groups to explore solutions.

The Internet Engineering Task Force is a large open community of network designers, operators, vendors, and researchers concerned with the Internet and the Internet protocol suite. It is organized around a set of eight technical areas, each managed by a technical area director. In addition to the IETF Chairman, the area directors make up the IESG membership. Each area director has primary responsibility for one area of Internet engineering activity, and hence for a subset of the IETF Working Groups. The area directors have jobs of critical importance and difficulty and are selected not only for their technical expertise but also for their managerial skills and judgment. At present, the eight technical areas and chairs are:

1) Applications	-	Russ Hobby/UC-Davis
2) Host and User Services	-	Craig Partridge/BBN
3) Internet Services	-	Noel Chiappa/Consultant
4) Routing	-	Robert Hinden/BBN
5) Network Management	-	David Crocker/DEC
6) OSI Integration	-	Ross Callon/DEC and Robert Hagens/UWisc.
7) Operations	-	Phill Gross/CNRI (Acting)
8) Security	-	Steve Crocker/TIS

The work of the IETF is performed by subcommittees known as Working Groups. There are currently more than 40 of these. Working Groups tend to have a narrow focus and a lifetime bounded by completion of a specific task, although there are exceptions. The IETF is a major source of proposed protocol standards, for final approval by the IAB. The IETF meets quarterly and extensive minutes of the plenary proceedings as well as reports from each of the working groups are issued by the IAB Secretariat at the Corporation for National Research Initiatives.

4. The Internet Research Task Force

To promote research in networking and the development of new technology, the IAB established the Internet Research Task Force (IRTF).

In the area of network protocols, the distinction between research and engineering is not always clear, so there will sometimes be overlap between activities of the IETF and the IRTF. There is, in fact, considerable overlap in membership between the two groups. This overlap is regarded as vital for cross-fertilization and technology transfer. In general, the distinction between research

and engineering is one of viewpoint and sometimes (but not always) time-frame. The IRTF is generally more concerned with understanding than with products or standard protocols, although specific experimental protocols may have to be developed, implemented and tested in order to gain understanding.

The IRTF is a community of network researchers, generally with an Internet focus. The work of the IRTF is governed by its Internet Research Steering Group (IRSG). The chairman of the IRTF and IRSG is David Clark. The IRTF is organized into a number of Research Groups (RGs) whose chairs of these are appointed by the chairman of the IRSG. The RG chairs and others selected by the IRSG chairman serve on the IRSG. These groups typically have 10 to 20 members, and each covers a broad area of research, pursuing specific topics, determined at least in part by the interests of the members and by recommendations of the IAB.

The current members of the IRSG are as follows:

David Clark/MIT LCS	-	Chairman
Robert Braden/USC-ISI	-	End-to-End Services
Douglas Comer/PURDUE	-	Member-at-Large
Deborah Estrin/USC	-	Autonomous Networks
Stephen Kent/BBN	-	Privacy and Security
Keith Lantz/Consultant	-	Collaboration Technology
David Mills/UDEL	-	Member-at-Large

5. The Near-term Agenda of the IAB

There are seven principal foci of IAB attention for the period 1989 - 1990:

1) Operational Stability
2) User Services
3) OSI Coexistence
4) Testbed Facilities
5) Security
6) Getting Big
7) Getting Fast

Operational stability of the Internet is a critical concern for all of its users. Better tools are needed for gathering operational data, to assist in fault isolation at all levels and to analyze the performance of the system. Opportunities abound for increased cooperation among the operators of the various Internet components [RFC 1109]. Specific, known problems should be dealt with, such as implementation deficiencies in some versions of the BIND domain name service resolver software. To the extent that the existing Exterior

Gateway Protocol (EGP) is only able to support limited topologies, constraints on topological linkages and allowed transit paths should be enforced until a more general Inter-Autonomous System routing protocol can be specified. Flexiblity for Internet implementation would be enhanced by the adoption of a common internal gateway routing protocol by all vendors of internet routers. A major effort is recommended to achieve conformance to the Host Requirements RFCs which were published in the fourth quarter of calendar 1989.

Among the most needed user services, the White Pages (electronic mailbox directory service) seems the most pressing. Efforts should be focused on widespread deployment of these capabilities in the Internet by mid-1990. The IAB recommends that existing white pages facilities and newer ones, such as X.500, be populated with up-to-date user information and made accessible to Internet users and users of other systems (e.g., commercial email carriers) linked to the Internet. Connectivity with commercial electronic mail carriers should be vigorously pursued, as well as links to other network research communities in Europe and the rest of the world.

Development and deployment of privacy-enhanced electronic mail software should be accelerated in 1990 after release of public domain software implementing the private electronic mail standards [RFC 1113, RFC 1114 and RFC 1115]. Finally, support for new or enhanced applications such as computer-based conferencing, multi-media messaging and collaboration support systems should be developed.

The National Network Testbed (NNT) resources planned by the FRICC should be applied to support conferencing and collaboration protocol development and application experiments and to support multi-vendor router interoperability testing (e.g., interior and exterior routing, network management, multi-protocol routing and forwarding).

With respect to growth in the Internet, architectural attention should be focused on scaling the system to hundreds of millions of users and hundreds of thousands of networks. The naming, addressing, routing and navigation problems occasioned by such growth should be analyzed. Similarly, research should be carried out on analyzing the limits to the existing Internet architecture, including the ability of the present protocol suite to cope with speeds in the gigabit range and latencies varying from microseconds to seconds in duration.

The Internet should be positioned to support the use of OSI protocols by the end of 1990 or sooner, if possible. Provision for multi-protocol routing and forwarding among diverse vendor routes is one important goal. Introduction of X.400 electronic mail services and interoperation with RFC 822/SMTP [RFC 822, RFC 821, RFC 987, RFC 1026, and RFC 1148] should be targeted for 1990 as well. These

efforts will need to work in conjunction with the White Pages services mentioned above. The IETF, in particular, should establish liaison with various OSI working groups (e.g., at NIST, RARE, Network Management Forum) to coordinate planning for OSI introduction into the Internet and to facilitate registration of information pertinent to the Internet with the various authorities responsible for OSI standards in the United States.

Finally, with respect to security, a concerted effort should be made to develop guidance and documentation for Internet host managers concerning configuration management, known security problems (and their solutions) and software and technologies available to provide enhanced security and privacy to the users of the Internet.

REFERENCES

[BARAN 64] Baran, P., et al, "On Distributed Communications", Volumes I-XI, RAND Corporation Research Documents, August 1964.

[CERF 74] Cerf V., and R. Kahn, "A Protocol for Packet Network Interconnection", IEEE Trans. on Communications, Vol. COM-22, No. 5, pp. 637-648, May 1974.

[CERF 82] Cerf V., and E. Cain, "The DoD Internet Protocol Architecture", Proceedings of the SHAPE Technology Center Symposium on Interoperability of Automated Data Systems, November 1982. Also in Computer Networks and ISDN, Vol. 17, No. 5, October 1983.

[CLARK 86] Clark, D., "The Design Philosophy of the DARPA Internet protocols", Proceedings of the SIGCOMM '88 Symposium, Computer Communications Review, Vol. 18, No. 4, pp. 106-114, August 1988.

[HEART 70] Heart, F., Kahn, R., Ornstein, S., Crowther, W., and D. Walden, "The Interface Message Processor for the ARPA Computer Network", AFIPS Conf. Proc. 36, pp. 551-567, June 1970.

[IEEE 78] Kahn, R. (Guest Editor), Uncapher, K. and H. Van Trees (Associate Guest Editors), Proceedings of the IEEE, Special Issue on Packet Communication Networks, Volume 66, No. 11, pp. 1303-1576, November 1978.

[IEEE 87] Leiner, B. (Guest Editor), Nielson, D., and F. Tobagi (Associate Guest Editors), Proceedings of the IEEE, Special Issue on Packet Radio Networks, Volume 75, No. 1, pp. 1-272, January 1987.

[LEINER 85] Leiner, B., Cole, R., Postel, J., and D. Mills, "The DARPA Protocol Suite", IEEE INFOCOM 85, Washington, D.C., March 1985. Also in IEEE Communications Magazine, March 1985.

[METCALFE 76] Metcalfe, R., and D. Boggs, "Ethernet: Distributed Packet for Local Computer Networks", Communications of the ACM, Vol. 19, No. 7, pp. 395-404, July 1976.

[POSTEL 85] Postel, J., "Internetwork Applications Using the DARPA Protocol Suite", IEEE INFOCOM 85, Washington, D.C., March 1985.

[RFC 821] Postel, J., "Simple Mail Transfer Protocol", RFC 821, USC/Information Sciences Institute, August 1982.

[RFC 822] Crocker, D., "Standard for the Format of ARPA Internet Text Messages", RFC 822, University of Delaware, August 1982.

[RFC 987] Kille, S., "Mapping between X.400 and RFC 822", University College London, June 1986.

[RFC 1000] Reynolds, J., and J. Postel, "The Request for Comments Reference Guide", RFC 1000, USC/Information Sciences Institute, August 1987.

[RFC 1026] Kille, S., "Addendum to RFC 987: (Mapping between X.400 and RFC 822)", RFC 1026, University College London, September 1987.

[RFC 1109] Cerf, V., "Report of the Second Ad Hoc Network Management Review Group", RFC 1109, NRI, August 1989.

[RFC 1113] Linn, J., "Privacy Enhancement for Internet Electronic Mail: Part I -- Message Encipherment and Authentication Procedures", RFC 1113, IAB Privacy Task Force, August 1989.

[RFC 1114] Kent, S., and J. Linn, "Privacy Enhancement for Internet Electronic Mail: Part II -- Certificate-based Key Management", RFC 1114, IAB Privacy Task Force, August 1989.

[RFC 1115] Linn, J., "Privacy Enhancement for Internet Electronic Mail: Part III -- Algorithms, Modes and Identifiers", RFC 1115, IAB Privacy Task Force, August 1989.

[RFC 1140] Postel, J., Editor, "IAB Official Protocol Standards", RFC 1140, Internet Activities Board, May 1990.

[RFC 1148] Kille, S., "Mapping between X.400(1988) / ISO 10021 and RFC 822", RFC 1048, UCL, March 1990.

[ROBERTS 70] Roberts, L., and B. Wessler, "Computer Network Development to Achieve Resource Sharing", pp. 543-549, Proc. SJCC 1970.

[ROBERTS 78] Roberts, L., "Evolution of Packet Switching", Proc. IEEE, Vol. 66, No. 11, pp. 1307-1313, November 1978.

Note: RFCs are available from the Network Information Center at SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025, (1-800-235-3155), or on-line via anonymous file transfer from NIC.DDN.MIL.

Author's Address

Vinton G. Cerf
Corporation for National Research Initiatives
1895 Preston White Drive, Suite 100
Reston, VA 22091

Phone: (703) 620-8990

EMail: VCERF@NRI.RESTON.VA.US